AN ASSESSMENT OF THE AVAILABILITY OF TRANSPORT INFRASTRUCTURE OBJECTS IN THE BALTIC REGION

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ABSTRACT

This article analyses the availability of transport infrastructure objects in the Baltic macroregion. With the help of the cluster and integral assessment methods, the authors differentiate and classify mesoregions of the Baltic macroregion according to the level of development of both individual transport types and the transport system as a whole. The theoretical contribution of the study lies in the revision of the existing integral indices of transport infrastructure object availability, whereas the practical contribution of the study relates to the possibility to apply the results obtained in developing and adjusting regional and industry-specific transport development programmes. An important conclusion of the study is the practical confirmation of the significant underdevelopment of the regions of North-West Russia (within the Baltic region) as to the availability of transport infrastructure objects in comparison to most mesoregions of the Baltic macroregion.

KEYWORDS: *Baltic region, transport infrastructure, Engel coefficient, the coefficient of transport infrastructure availability.*

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Introduction

The prospects for the strategic development of the regions belonging to the Northwestern Federal District are usually considered in the context of the Baltic macroregion – a territory bringing together the countries or parts of countries bordering the Baltic Sea (Основные положения (...), 2011). European and – under its influence – also Russian literature calls this territorial formation the Baltic region (Baltic Sea Region Programm, 2013; Görmar, 2010). Despite the multitude of academic approaches to identifying the borders and composition of the macroregion, almost all researchers are unanimous in that the macroregion is a complex coherent region, which makes it possible to identify and study individual regions specialising in certain industries (Федоров, Зверев, Кореевец, 2008). Our earlier works, as well as those published by our colleagues from the Immanuel Kant Baltic Federal University (Gumenyuk, Melnik, 2012; Мельник, 2012; Gumeniuk, 2013), justify the identification of the Baltic transnational transport region (BTTR) as a fully-fledged research object. The effective functioning of the BTTR as a unified international transport system requires that all constituent territories of the region secure high availability of transport infrastructure objects and that the elements of transport infrastructure interact according to clear rules and supplement each other. In this connection, it is of importance to analyse the existing availability of transport infrastructure objects on all territories comprising the BTTR, and, which is especially relevant to our case, to give an assessment of the status of the BTTR regions of the Northwestern Federal District of Russia as compared to the other constituents of the transnational transport region.

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It is worth noting that such studies are rarely carried out at the level of international macroregions (an example of which is the Baltic transboundary transport region). More often, one can come across works focusing on an integral assessment of the availability of transport infrastructure objects at the level of municipalities (Девятова, 2008), individual constituent entities (Зандер, Корякова, 2011), or larger economic regions of the country (Горчаков, 2002). In this work, we draw on the results of studies carried out by I. A. Semina and L. N. Folomeikin (Сёмина, Фоломейкина, 2009), as well as A. S. Tarkhov (Тархов, 2005).

It is advisable to carry out a comparative analysis of availability of transport infrastructure objects not at the level of countries but at that of administrative and territorial units that comprise the Baltic region. It will make it possible to perform a more accurate differentiation of the territory according to the availability of transport infrastructure objects and identify the features of transport system development at the level of individual administrative and territorial units. For the purpose of comparison and the possibility of employing the European Statistics Database, it is advisable to consider not the administrative and territorial divisions peculiar to each country but rather the broadly used in the EU NUTS (Nomenclature of Territorial Units for Statistics) regions as individual objects.

In this article, we will conduct a comparative analysis of the availability of transport infrastructure objects at the NUTS 2 level (for the EU countries and Norway) and corresponding constituent entities of the Russian Federation. In addition, we will also compare transport infrastructure availability at the level of the Baltic region countries. As to Russia, we will focus on the Northwestern Federal District (within the BTTR) as an individual territorial agent, which is comparable in terms of areas, population, and other basic characteristics to EU member states.

1. Baltic transnational transport region

According to the composition and borders of the Baltic transnational transport region (BTTR) identified in earlier publications (Gumenyuk, Melnik, 2012; Мельник, 2012; Gumeniuk, 2013), the structure of the BTTR mesoregions is as follows (table 1 and figure 1).

Table 1. NUTS 2 regions and the corresponding BTTR constituent entities of the Russian Federation

No	Country	Code	Area, km^2	Population (people)	GDP per capita, Euro
	Denmark	**DKO**	**42 894**	**5547700**	41 300
1	Hovedstaden	DK01	2546.3	1689800	52 300
2	Sjælland	DK02	7217.8	820200	30 200
3	Southern Denmark	DK03	12256.5	1200500	38 100
4	Midtjylland	DK04	13000.2	1257500	38 800
5	Nordjylland	DK05	7874	579700	36 600
	Germany (within the Baltic region)	**DE**	**39 745.00**	**6260200**	**30500**
6	Mecklenburg-Vorpommern	DE80	23190.7	1646800	20900
7	Schleswig-Holstein	DEF0	15799.2	2833100	25400
8	Hamburg	DE60	755.16	1780300	52200
	Poland (within the Baltic region)	**PL**	**65375.8**	**5355500**	9 200
9	West Pomeranian voivodeship	PL42	22829.4	1693100	8 000
10	Warmian-Masurian voivodeship	PL62	24173.1	1427200	6 800
11	Pomeranian voivodeship	PL63	18310.3	2235200	8 800
12	**Latvia**	LV0	64 559	2239000	8600
13	**Lithuania**	LT0	65 300	3286800	8900
14	**Estonia**	EE0	45 288	1240200	10700

	Finland	**FI**	**338 144**	**5363300**	**33300**
15	East Finland	FI13	85 171	651400	
16	South Finland	FI18	45 232	2681000	28300
17	West Finland	FI19	64647.1	1357600	30000
18	North Finland	FI1A	141540.7	645400	27000
19	Åland	FI20	1 551.90	27900	40300
	Sweden	**SE**	**441369.5**	**9378100**	37 300
20	Stockholm	SE11	6789.2	2036800	50 700
21	East Middle Sweden	SE12	41415.2	1563800	31 800
22	Småland and the islands	SE21	35560.2	810800	32 600
23	South Sweden	SE22	14423.9	1390100	32 300
24	West Sweden	SE23	31108.3	1873000	35 300
25	North Middle Sweden	SE31	69547.7	826400	32 100
26	Middle Norrland	SE32	77207	369500	36 300
27	Upper Norrland	SE33	165295.6	507700	38 100
	Norway	**NO**	**323 758**	**4889200**	**65000**
28	Oslo og Akershus	NO01	5 371	1134100	69100
29	Hedmark og Oppland	NO02	52 579	376800	36 800
30	Sør-Østlandet	NO03	36 641	933800	39 900
31	Agder og Rogaland	NO04	25 819	712700	54 900
32	Vestlandet	NO05	49 172	840700	51 100
33	Trøndelag	NO06	41 282	424200	44 400
34	Nord-Norge	NO07	112 948	466900	43 100
	Northwestern Federal District of Russia (within the Baltic region)		**210332**	**8250800**	
35	Kaliningrad region	39	15125	941500	5200
36	Leningrad region, including Saint Petersburg	47	85307	6001700	9100
37	Novgorod region	53	54501	634100	5000
38	Pskov region	60	55399	673500	3200

Source: compiled by the authors on the basis of Eurostat, 2013; Federal'naja sluzhba gosudarstvennoj statistiki, 2013

We have identified 38 mesolevel territories within the BTTR, which will be used as units of analysis when considering the transport infrastructure availability. In order to explain the data obtained, it is worth noting that the Baltic states (Lithuania, Latvia, and Estonia) are not divided into NUTS 1 and NUTS 2 units (they are comprised of NUTS 3 units). Saint Petersburg is analysed as a part of the Leningrad region, since the transport infrastructure of these regions was formed and is functioning as an integral whole, which complicates the identification of the administrative affiliation of most transport infrastructure objects.

For any territory, an analysis of transport infrastructure availability proves to entail certain methodological complications. It is advisable to conduct it in view of the fundamental socioeconomic characteristics of the territory (area, population, production development level, etc.).

Figure 1. NUTS 2 regions and the corresponding BTTR constituent entities of the Russian Federation

Source: compiled by the authors on the basis of Regions in the European Union – Nomenclature of territorial units for statistics – NUTS 2006

2. The analyse of the transport network availability

The objects of transport infrastructure can be divided into two types:

- linear objects (roadways and railways, inland waterways);
- singular point objects (airports, sea- and river ports, checkpoints, etc.).

The major complication consists in that most indices of transport infrastructure development assessment relate to only one of these types.

The aggregate of linear transport objects is usually called a transport network. In order to analyse the transport network availability in a certain territory, one employs a large number of indices, the most prevalent of which it the transport network density. In this work, we will use the Engel coefficient (K_E), which allows for not only the area, but also the population of the territory:

$$C_E = \frac{L}{\sqrt{S \cdot N}}$$

Where L stands for the length of the transport system in the region (km); S for the region's territory (km^2); and N for the number of population (people).

The calculation of the Engel coefficient was performed for three linear objects of the transport infrastructure:

- hard-surface roads;
- railways of general use (without taking into account special-purpose sections of a non-standard gauge);
- navigable inland waterways (both natural and man-made).

Table 2. The Engel coefficients for the BTTR mesoregions

No	Country	Code	Engel coefficient (motorways)	Engel coefficient (railways)	Engel coefficient (water transport)
1	Hovedstaden	DK01	101.47	2.41	0.00
2	Sjælland	DK02	161.71	5.82	0.00
3	Southern Denmark	DK03	183.71	6.26	0.00
4	Midtjylland	DK04	162.64	6.30	0.00
5	Nordjylland	DK05	175.29	7.22	0.00
6	Mecklenburg-Vorpommern	DE80	51.19	8.55	5.13
7	Schleswig-Holstein	DEF0	46.75	6.04	3.49
8	Hamburg	DE60	5.56	9.74	1.45
9	West Pomeranian voivodeship	PL42	97.05	6.11	1.33
10	Warmian-Masurian voivodeship	PL62	124.27	6.67	1.88
11	Pomeranian voivodeship	PL63	111.34	6.12	2.60
12	Latvia	LV0	192.20	5.00	0.00
13	Lithuania	LT0	174.91	3.82	0.97
14	Estonia	EE0	244.88	3.87	1.41
15	East Finland	FI13	88.93	7.73	23.52
16	South Finland	FI18	51.92	4.01	3.85
17	West Finland	FI19	70.95	5.42	2.32
18	North Finland	FI1A	60.78	3.71	1.57
19	Åland	FI20	139.51	0.00	0.00
20	Stockholm	SE11	23.33	3.42	0.67
21	East Middle Sweden	SE12	62.94	7.18	1.71
22	Småland and the islands	SE21	80.98	7.04	0.29
23	South Sweden	SE22	59.22	6.60	0.00
24	West Sweden	SE23	60.72	6.32	2.18
25	North Middle Sweden	SE31	55.84	7.68	1.12
26	Middle Norrland	SE32	65.83	8.72	0.00
27	Upper Norrland	SE33	61.69	6.93	0.00

No	Country	Code	Engel coefficient (motorways)	Engel coefficient (railways)	Engel coefficient (water transport)
28	Oslo og Akershus	NO01	78.97	4.61	0.00
29	Hedmark og Oppland	NO02	86.93	6.67	0.00
30	Sør-Østlandet	NO03	80.51	5.12	0.58
31	Agder og Rogaland	NO04	97.18	3.47	0.00
32	Vestlandet	NO05	91.51	1.20	0.00
33	Trøndelag	NO06	79.88	5.53	0.00
34	Nord-Norge	NO07	80.58	2.01	0.00
35	*Kaliningrad region*	39	52.81	5.18	4.13
36	*Leningrad region, including Saint Petersburg*	47	16.68	4.07	2.66
37	*Novgorod region*	53	49.33	6.15	3.32
38	*Pskov region*	60	56.75	5.65	2.60
The average C_E for the BTTR mesoregions			**89.9**		

Source: the author's calculations on the basis of Борисевич, Гейзлер, Фатеев, 2002; Коврик, 2012; EU transport in figures, 2012; Транспорт в России, 2013; Transport. Activity results in 2011, 2012

The Engel coefficient is a rather widespread method of assessing the transport network availability in a region; however, its main drawback is that it is calculated for each element of the transport network individually and does not make it possible to analyse the general level of transport system development.

As table 2 shows, the values of the Engel coefficient exhibit a significant territorial differentiation (fig. 2). The index of roadway intensity ranges from 244.9 in Estonia to 5.56 in Hamburg. Such low value of the coefficient in Hamburg (as well as Saint Petersburg, Copenhagen, and Stockholm) is explained by the high population density. The Engel coefficient for railways does not range so widely. The level of water transport development is the least differentiated: it is absent in 14 regions, in 16 regions, it does not exceed 5. The only exception is East Finland (23.5), which boasts a developed water transport network.

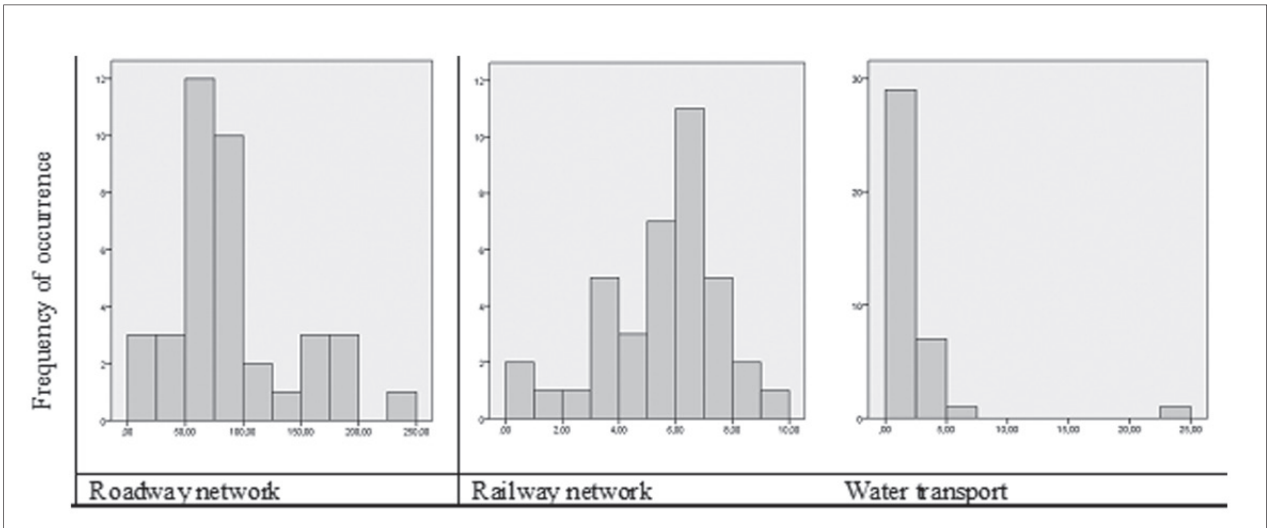

Figure 2. The frequency of occurrence of the Engel coefficient values in the BTTR mesoregions

In order to systematise the obtained Engel coefficient values, we conducted an iterative k-means cluster analysis, as a result of which three groups were identified (table 4).

The first cluster brings together regions with the highest level of motorway network development (an average coefficient of 185). The railway intensity is close to the regional average. Water transport is poorly developed. This group includes Zealand, Southern Denmark, Central and Northern Jutland (Denmark); Estonia, Latvia, and Lithuania.

The second cluster brings together the regions of Poland (Warmian-Masurian, West Pomeranian, and Pomeranian voivodeships), Finland (East Finland and Åland), Sweden (Småland), and the whole territory of Norway. This group is characterised by a developed roadway network and median regional values of railway and water transport availability (with the exception of East Finland).

The third cluster is characterised by the lowest level of roadway development and a railway intensity of above the regional average. Water transport is poorly developed. This cluster brings together Mecklenburg-Vorpommern, Schleswig-Holstein, and Hamburg (Germany); South, West, and North Finland; Stockholm, East Middle Sweden, South Sweden, West Sweden, North Middle Sweden, Middle Norrland, Upper Norrland (Sweden); the Kaliningrad, Novgorod, and Pskov regions, and the Leningrad region and Saint Petersburg (Russia).

Table 3. The central values

	Clusters		
	1	2	3
Motor transport	185.05	95.20	49.13
Railway transport	5.47	4.79	5.90
Water transport	0.34	2.32	2.01

Source: compiled by the authors

3. The analyse of transport infrastructure as an integral system

The Engel coefficient gives a clear picture of the availability of certain types of transport infrastructure in mesoregions; however, it does not give a comprehensive idea of the development of transport infrastructure as an integral system. It is a result of not only the incoherence of calculations for different modes of transport, but also its inapplicability in case of singular point objects of transport infrastructure, which form the backbone of the Baltic transnational transport region. In order to overcome these disadvantages of the analysis methodology, it is advisable to use integral indices that take into account the level of development of all modes of transport constituting the regional transport system.

In our opinion, the most adequate integral index is the transport infrastructure availability coefficient (C_{TI}) proposed by a team of authors led by M. S. Zaretskaya (Politika "Severnogo izmerenija", 2011). However, this methodology requires certain adjustments.

1. The authors of the methodology suggest that airports with a number of passengers of more than 150 thousand people per year are considered as the smallest unit. In our opinion, it is preferable to reduce the threshold to 100 thousand people per year. It corresponds to the international standards, which suggest that the classification of airports starts with those with an annual passenger number of more than 100,000 people.
2. Moreover, it is not clear what objective reasons lie behind the introduction of a decreasing weighted factor for air and inland water transport into the methodology of integral coefficient calculation. The authors emphasise the "auxiliary nature" of these modes of transport for the macroregion in general without providing a convincing proof. In this connection, we made a decision to forgo the use of decreasing weighted factors, since an analysis of the macroregional level transport system development requires the objective understanding that, for certain regions, the air and inland water transport are identified as priorities as a result of the geographical position and environmental features of mesoregions.

Thus, the calculation of transport infrastructure availability will be based on the following formula:

$$C_{TI} = \frac{A+B+C+D+E}{5}$$, where

A stands for the motorway density index, km/1000 km²;

B for the railway density index, km/1000 km²;

C for the inland waterway density index, km/1000 km²;

D for the index of airports with a number of passengers of more than 100,000 people per year;

E for the large seaports with an annual cargo tonnage of more than 1 m tons or an annual number of passenger of more than 200,000 people.

The A, B, C, D, E indices were calculated for each region according to the formula:

$$X - X_{\min} \Big/ X_{\max} - X_{\min},$$

Where: X stands for the index value for the given region;

X_{min} for the minimum value for all regions under consideration;

X_{max} for the maximum value for all regions.

We calculated the BTTR transport infrastructure availability coefficient at the level of individual mesoregions, as well as for the purpose of comparison at the level of countries (or a country's part comprising the BTTR).

In order to calculate the C_{TI} for individual BTTR countries, we obtained the following values:

for A: X_{max} – 1727.6, X_{min} – 182.4;

for B: X_{max} – 83, X_{min} – 12.8;

for C: X_{max} – 45.1, X_{min} – 0;

for D: X_{max} – 26, X_{min} – 1;

for E: X_{max} – 30, X_{min} – 2;

Table 4. The coefficient of transport infrastructure availability according to countries (or their parts) comprising the Baltic transboundary transport region

No	Country (its part)	A	B	C	D	E	C_{TI}
1	Denmark	1.00	0.70	0.00	0.20	0.82	2.09
2	Germany	0.21	1.00	1.00	0.16	0.29	2.90
3	Poland	0.52	0.62	0.38	0.04	0.11	1.46
4	Latvia	0.61	0.24	0.00	0.08	0.04	0.53
5	Lithuania	0.68	0.20	0.15	0.00	0.00	0.56
6	Estonia	0.71	0.11	0.16	0.00	0.11	0.57
7	Finland	0.03	0.07	0.52	0.36	0.71	1.83
8	Sweden	0.10	0.18	0.07	0.76	1.00	2.14
9	Norway	0.08	0.00	0.01	1.00	0.86	1.95
10	Russia's NWFD	0.00	0.21	0.28	0.04	0.14	0.78

Source: calculated by the authors on the basis of EU transport in figures, 2012; Транспорт в России, 2013; Transport. Activity results, 2012; The World Factbook, 2011; Baltic port list, 2012.

The calculations show a clear division of the BTTR states into three groups:

Countries with a high level of transport infrastructure availability (C_{TI} > 2). This group brings together Denmark, Germany, and Sweden – the undisputed economic leaders of the region, which determine (and often form) the vector of regional development, including that in the field of transport system.

Countries with a sufficient level of transport infrastructure availability ($2 > C_{TI} > 1$). This group is comprised of Poland, Finland, and Norway – countries with a developed transport infrastructure, which is sufficient to meet the existing needs. At the same time, the reasons behind such value of the coefficient vary from country to country. Norway and Finland are Nordic countries with harsh environmental conditions; the economic and human potential of these countries is concentrated in the south, whereas the north is populated irregularly. In such conditions, the development of linear transport infrastructure objects is not rational and singular point objects (first of all, seaports and airports) become key transport elements. However, Poland launched a massive modernisation of its transport system (following the German model) just few decades ago; this process has not been completed yet. Poland has all prerequisites for the qualitative development of all modes of transport, whereas the current level of transport infrastructure availability indicates the need for a further increase in the pace of modernisation.

The third group is the countries with a low level of transport infrastructure availability ($C_{TI} < 1$). This group brings together the Baltics and the Northwestern Federal District. In these countries, the level of transport infrastructure availability is approximately half that of the second group countries and almost five times lower than that of the macroregional leaders. It is a direct consequence of the economic situation, which was not favourable for a massive transport system modernisation for a long time. Having acceded to the EU, the Baltics launched a number of projects aimed to equip their territories with new transport infrastructure objects; however, one must emphasise that these efforts are insufficient to catch up with the macroregional leaders in terms of infrastructure availability. As to the NWFD, the situation is quite similar to that observed it in the Baltics; the transport system has not been modernised for a long time, and large-scale transport projects were not launched until a decade ago.

In the framework of calculating the transport infrastructure availability coefficient for the BTTR mesoregions, the maximum and minimum values for each index are as follows:

for A: X_{max} – 2613, X_{min} – 108.1;
for B: X_{max} – 472.7, X_{min} – 0;
for C: X_{max} – 70.1, X_{min} – 0;
for D: X_{max} – 11, X_{min} – 0;
for E: X_{max} – 12, X_{min} – 0.

An analysis of the data obtained makes it possible to formulate a number of practical conclusions about the dissimilar levels of transport infrastructure availability in BTTR mesoregions, which is in full compliance with the current features of the socioeconomic development of the macroregion:

1. The undoubted leader in the macroregion – both in terms of the transport system development level and the indices of transport system performance – is the German city of Hamburg, which has the status of a federated state (C_{TI} – 2.69). This mesoregion is characterised by the highest density of railways (427.7 km/km²) and inland waterways (70 km/km²) among all BTTR mesoregions.

2. Nord-Norge (Northern Norway) is a classic example of a Nordic mesoregion, whose transport system is oriented towards the maximum engagement of air and water transport, whereas linear transport infrastructure objects are "pushed" into the background. So, this BTTR region is the leader in the number of airports included into the classification (11 units) and one of the leaders in the number of seaports (11 ports, only the Finnish region of South Finland boasts a greater amount – 12). Such "Nordic" model of transport infrastructure development is quite efficient and is capable of satisfying the regional transport needs, which is clearly demonstrated by the mesoregion (C_{TI} – 2.0, ranks second among all BTTR mesoregions).

3. It is also worth identifying the mesoregions excelling in terms of individual indices. As mentioned above, as to the number of seaports, the leader is the Finnish region of South Finland (12 seaports), whereas in terms of roadway density, it is the Danish region of Hovedstaden (the Capital region) (roadway density of 2613.9 km/km²).

4. One should also mention that the variation of C_{TI} values is much greater at the mesoregional level (from max 2.7 to min 0.04) than at the level of countries (from max 2.9 to min 0.53), which is explained by a large number of objects analysed and the fundamental features of certain mesoregions. So, the lowest ranked region in terms of transport infrastructure availability (C_{TI} – 0.04) is the Finnish mesoregion of Åland (the Åland Islands), which seems quite logical in view of the cultural and historical features of the mesoregion. At the same time, one should understand that the current level of regional infrastructure development is sufficient to meet the local transport infrastructure needs.

Table 5. The coefficient of transport infrastructure availability by BTTR countries (or their parts)

No	Mesoregion	Code	A	B	C	D	E	C_{TI}
1	Hovedstaden	DK01	1.00	0.13	0.00	0.18	0.25	0.80
2	Sjælland	DK02	0.64	0.13	0.00	0.00	0.58	0.88
3	Southern Denmark	DK03	0.68	0.13	0.00	0.09	0.50	0.90
4	Midtjylland	DK04	0.60	0.13	0.00	0.18	0.33	0.81
5	Nordjylland	DK05	0.56	0.13	0.00	0.09	0.42	0.79
6	Mecklenburg-Vorpommern	DE80	0.13	0.15	0.62	0.09	0.25	1.30
7	Schleswig-Holstein	DEF0	0.21	0.17	0.66	0.18	0.50	1.74
8	Hamburg	DE60	0.06	1.00	1.00	0.18	0.08	2.69
9	West Pomeranian voivodeship	PL42	0.29	0.11	0.16	0.09	0.25	0.74
10	Warmian-Masurian voivodeship	PL62	0.34	0.11	0.21	0.00	0.00	0.44
11	Pomeranian voivodeship	PL63	0.45	0.14	0.41	0.09	0.17	1.02
12	Latvia	LV0	0.41	0.06	0.00	0.27	0.25	0.70
13	Lithuania	LT0	0.45	0.06	0.10	0.09	0.17	0.54
14	Estonia	EE0	0.47	0.04	0.10	0.09	0.42	0.79
15	East Finland	FI13	0.05	0.05	0.93	0.18	0.00	1.37
16	South Finland	FI18	0.12	0.07	0.41	0.18	1.00	1.81
17	West Finland	FI19	0.09	0.05	0.15	0.18	0.33	0.79
18	North Finland	FI1A	0.01	0.02	0.05	0.45	0.50	1.07
19	Åland	FI20	0.19	0.00	0.00	0.00	0.00	0.04
20	Stockholm	SE11	0.12	0.13	0.17	0.36	0.25	1.01
21	East Middle Sweden	SE12	0.11	0.09	0.15	0.18	0.33	0.84
22	Småland and the islands	SE21	0.11	0.07	0.02	0.27	0.17	0.59
23	South Sweden	SE22	0.19	0.14	0.00	0.27	0.50	1.00
24	West Sweden	SE23	0.14	0.10	0.24	0.18	0.50	1.15
25	North Middle Sweden	SE31	0.03	0.06	0.05	0.09	0.25	0.49
26	Middle Norrland	SE32	0.01	0.04	0.00	0.09	0.17	0.32
27	Upper Norrland	SE33	0.00	0.03	0.00	0.36	0.33	0.75
28	Oslo og Akershus	NO01	0.41	0.14	0.00	0.27	0.08	0.62
29	Hedmark og Oppland	NO02	0.05	0.04	0.00	0.00	0.08	0.14
30	Sør-Østlandet	NO03	0.12	0.05	0.04	0.00	0.33	0.48
31	Agder og Rogaland	NO04	0.16	0.04	0.00	0.27	0.25	0.62
32	Vestlandet	NO05	0.11	0.01	0.00	0.45	0.42	0.94
33	Trøndelag	NO06	0.06	0.04	0.00	0.36	0.33	0.78
34	Nord-Norge	NO07	0.02	0.01	0.00	1.00	0.92	2.00
35	*Kaliningrad region*	39	0.13	0.09	0.46	0.09	0.08	0.87
36	*Leningrad region, including Saint Petersburg*	47	0.01	0.07	0.32	0.09	0.42	0.99
37	*Novgorod region*	53	0.03	0.04	0.16	0.00	0.00	0.25
38	*Pskov region*	60	0.04	0.05	0.13	0.00	0.00	0.22

Source: calculated by the authors on the basis of EU transport in figures, 2012; Транспорт в России, 2013; Transport. Activity results, 2012; The World Factbook, 2011; Baltic port list, 2012

All in all, when analysing the level of transport infrastructure object availability in BTTR mesoregions, one can identify four groups of regions demonstrating different availability levels (fig. 3).

1. Regions with low availability of transport infrastructure objects ($C_{TI} < 0.5$). This group brings together 8 BTTR mesoregions, including two Russian regions – the Pskov and Novgorod ones. Moreover, the group includes the Warmian-Masurian region of Poland. There are similar reasons behind these regions being classed as group 1. These regions border on the acknowledged economic centres of these countries (Saint Petersburg and Gdansk respectively), as result of which an outflow of the economic and social potential takes place in these regions. The regions themselves actively use the transport infrastructure of the neighbouring economically developed regions, which results in the formation of a local level centre-periphery model of regional interaction.
2. Regions with a satisfactory level of availability of transport infrastructure objects ($0.5 < C_{TI} < 1$). It is the largest group bringing together 18 BTTR mesoregions, including two Russian regions – the Kaliningrad ($C_{TI} – 0.72$) and Leningrad ($C_{TI} – 0.99$) ones.
3. Regions with a good level of availability of transport infrastructure objects ($1 < C_{TI} < 1.5$). This group comprises seven mesoregions.
4. Regions with a high level of availability of transport infrastructure objects ($C_{TI} > 1.5$). This group brings together four mesoregions – the above mentioned Hamburg, Nord-Norge, and South Finland, and Schleswig-Holstein.

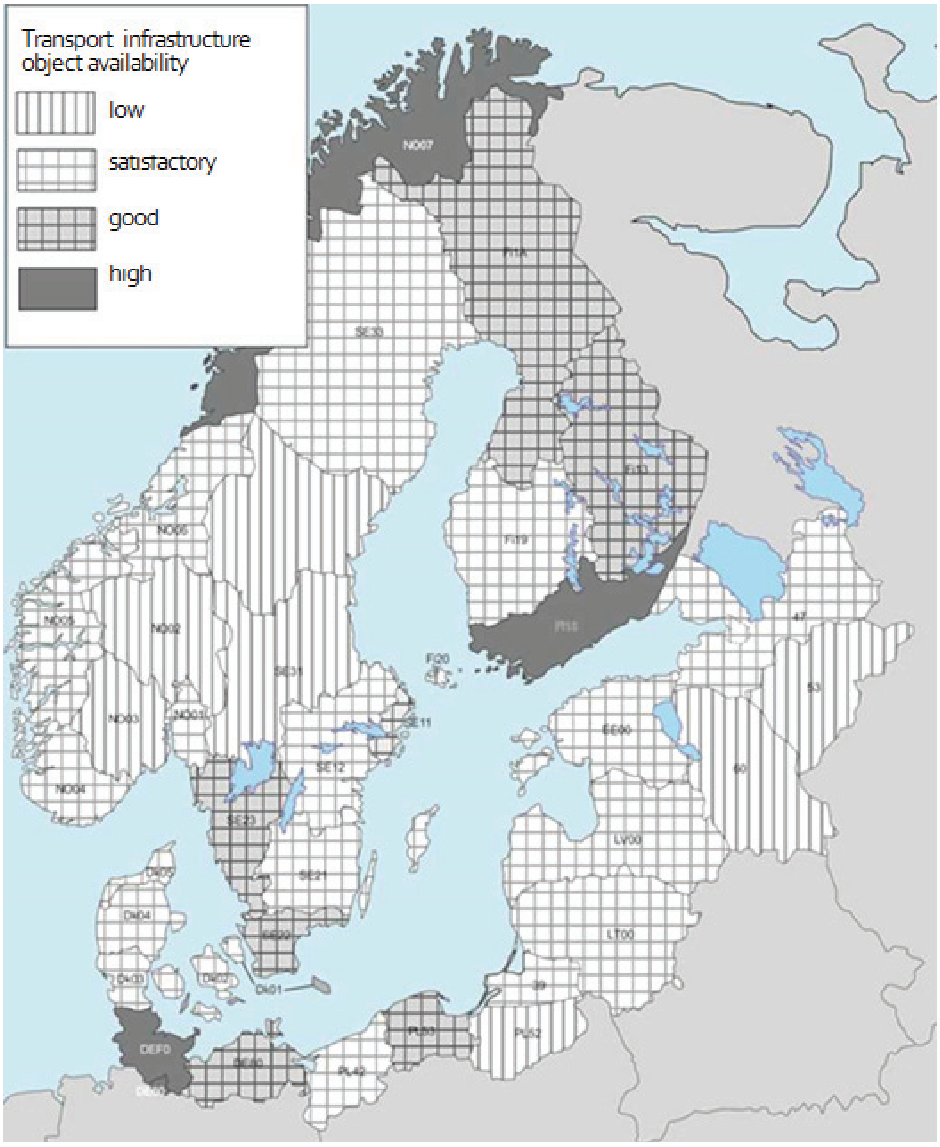

Figure 3. The grouping of BTTR regions according to the transport infrastructure object availability

Conclusions

Going back to the regions of North-West Russia, one must stress that their level of availability of transport infrastructure objects is insufficient for efficient integration into the unified transport system of the Baltic region in a short-term perspective. It holds true both for the relatively well-performing Leningrad and Kaliningrad regions and the Pskov and Novgorod region. Moreover, one should not overlook the fact that some of the regions' transport infrastructure objects are worn out and outdated, which aggravates the situation even more. We can hardly suggest any new solution to the problem rather than those already familiar to the authorities and national specialists in the field of transport. However, in our opinion the first measures to be taken should be as follows:

1. An update of regional plans and strategies for the transport system development in line with the global strategic prospects of the development of the macroregion as a whole. The key objective of such documents is to identify the role of regional transport systems in the macroregional transport system of the Baltic region.
2. The maximum engagement of mechanisms designed to attract investment for transport projects. It relates to both public (for instance, active participation in federal target and industry-specific programmes) and private (an increase in investment attractiveness) financial support for regional projects. Of great importance can be the public-private partnership mechanism, which is still insufficiently developed in Russia.
3. Increased participation in international projects and programmes, which will make it possible to harmonise the national transport development plans with the global strategy for the Baltic macroregion development.

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TRANSPORTO INFRASTRUKTŪROS OBJEKTŲ FUNKCIONALUMO ĮVERTINIMAS BALTIJOS JŪROS REGIONE

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Santrauka

Šiame straipsnyje aptariamas transporto infrastruktūros objektų funkcionalumas ir jo įvertinimas Baltijos jūros regione. Tyrimas apima 38 regiono teritorijas, kurios buvo suskirstytos pagal transporto tipus ir transporto sistemas Baltijos jūros valstybių regionuose ir konkrečiose jų teritorijose. Tyrimui atlikti taikyti klasterinės ir integralinės analizės metodai, apskaičiuoti *Engelio* ir transporto infrastruktūros funkcionalumo koeficientai. Apskaičiuoti ir palyginti su gamybos transporto plėtros programomis Baltijos jūros regiono valstybėse funkcionalumo indeksai. Nustatyta, kad Šiaurės Vakarų Rusijos regionams (Sankt Peterburgo, Leningrado srities, Pskovo ir Novgorodo) būdingas nepakankamas transporto infrastruktūros funkcionalumas, todėl veiksminga transporto sistemų integracija į Baltijos jūros regiono erdvę nevyksta.

PAGRINDINIAI ŽODŽIAI: *Baltijos jūros regionas, Engelio koeficientas, transporto infrastruktūros funkcionalumo koeficientas ir indeksai.*

JEL KLASIFIKACIJA: R400